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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A meteorological and chemical overview of the DACCIWA field campaign in West Africa in June–July 2016" *by* Peter Knippertz et al.

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General comments : The aim of this manuscript is to provide the large-scale climatological context of the DACCIWA June-July 2016 field campaign and describe the behavior of the West African monsoon system into its specific phases, to characterize the most important synoptic scale weather systems affecting the Southern West Africa area and to discuss impacts on rainfall, clouds and atmospheric composition. A detailed description of the field activities will be provided in a companion paper (Flamant et al. 2017, submitted).

This type of work is essential for any field campaign in order to describe its general

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Discussion paper

context in terms of departures from the climatology and of occurrences of main weather system features within the campaign. The submitted manuscript is of a very high quality regarding these terms. It presents very clearly the up-to-date knowledge of the West African monsoon main features and uses them very accurately to highlight the different phases of the monsoon during June-July 2016, and then the main synoptic weather events within each of these phases. This is based on a rigorous analysis and use of the available data sets (not the new field measurements that will be analyzed in future papers) and up-to-date relevant tools. It is also quite synthetic and provides a very clear summary of the main features of the monsoon evolution and variability. So it will enable to investigate any field measurements in a well-known meteorological context and it let also space to investigate more any of the synoptic weather events identified here.

This manuscript addresses relevant scientific questions within the scope of ACP. It present novelties regarding the 2016 monsoon season and offers promising avenues to be addressed with the new DACCIWA measurements. Proper credit is given to previous work, in particular regarding the knowledge provided by the AMMA program and the available tools to detect and monitor synoptic weather systems in this area. The abstract provides a concise and complete summary. The manuscript is well structured and the results are very clearly presented.

Specific comments : A lot of diagnostics have been used in an accurate way to detect and monitor the main weather events during the DACCIWA campaign. I would like however to suggest testing some others to evaluate if they can provide additional clues in the interpretation of the monsoon evolution and variability in June-July 2016. I let it to the decision of the authors to see if some of them can be fruitful or not, because the manuscript is presently already in a relevant shape to be published :

- Regarding the SHL evolution, the diagnostics of Chauvin et al. (2010) on the quantification of east-west phases of SHL has been noticed and not used (the reference Roehrig et al., J. Climate, 2011, 5863-5878 should be indicated too). It defines an in-

dex different from Lavaysse et al's index and could provide complementary information and quantification.

- K. Cook (2015, J. Geophys. Res. Atmos., 120, 3085–3102, doi:10.1002/2014JD022579) introduced the inertial instability criterion to characterize the monsoon onset over West Africa. It could be useful to test it here for the monsoon onset of 2016.

- Poan et al. (2013, J. Atmosph. Sci., 70, 1035-1050) showed that the precipitable water variable can be a very useful indicator to monitor synoptic weather system trajectories (especially for westward AEW propagation over the Sahel). It can be evaluated on Hovmoeller diagrams as in Fig.9 and Fig.10.

- Regarding case studies H1-H2 and I1-I2 where jointly westward propagating coupled of cyclonic and anticyclonic vorticities have been detected, Diedhiou et al. (1999, Climate Dyn, 15, 795-822) identified such patterns during Gate Phase I and proposed a composite structure associated to a 6-9-day signal in atmospheric circulation associated with a clear modulation of the westerly/easterly wind component in the mid-levels as it is detected in 2016. More investigation in this way might provide additional information.

- The possible combination of AEW and MRG signals as it was presented by Cheng-Thorncroft-Kiladis, at the 2017 EGU session on Atmospheric composition, weather and climate in Sub-Saharan Africa might be interesting in future papers.

- Considering Fig.19, could you imagine one more figure as Fig.17 or Fig.18 to illustrate some variability of pollution plumes linked to the A-J weather events ? Or maps for very contrasted impact linked to two of these 10 events ?

Technical corrections : Use the widest possible space within the page for Fig.9 and Fig.10 because there is a lot of superimposed information that is not always clearly detectable for the reader.

The reference of the companion paper Flamant et al. (submitted) is missing in the reference list.

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